We claim:

1. A device for filtering at least a predetermined selected optical signal having a predetermined wavelength range from a series of optical signals, the device comprising:

a polarisation alignment means for substantially aligning substantially orthogonal polarisation states of an optical input signal so as to produce a polarisation aligned optical signal;

a polarisation manipulation means for imparting a controlled polarisation manipulation to said polarisation aligned optical signal so as to output a polarisation manipulated optical signal having one of at least two distinguishable polarisation states including a first polarisation state and a second polarisation state; and

an optical separation means for spatially separating the selected optical signal from said series of optical signals when the polarisation state of the polarisation manipulated optical signal is in a first polarisation state, thereby forming a first and second output optical signal, and maintaining the spatial alignment of said selected optical signal with said series of optical signals when the polarisation manipulated optical signal is in a second polarisation state so as to form a third optical output.

2. A device as claimed in claim 1 wherein said optical separation means comprises an etalon filter.

3. A device as claimed in claim 2 wherein said etalon filter is a tunable liquid crystal etalon filter having a tunable separation wavelength.

4. A device as claimed in claim 3 wherein said etalon filter transmits the selected optical signal when the polarisation state of the second optical signal is in said first polarisation state and reflects the selected optical signal when the polarisation state of the second optical signal is in the second distinguishable state.

5. A device as claimed in claim 1 wherein said polarisation manipulation means comprises a controlled liquid crystal device and quarter wave plate which impart a controlled rotation to said polarisation aligned optical signal to produce said polarisation manipulated optical signal.

6. A device as claimed in claim 1 wherein said first and second polarisation state are orthogonal.

7. A device as claimed in claim 1 wherein said polarisation alignment means further comprises:

a polarisation separation means for spatially separating substantially orthogonal polarisation states of said input signal;

a polarisation rotation element for rotating at least one of said spatially separated substantially orthogonal polarisation states so as to bring it into line with the other of said spatially separated substantially orthogonal polarisation states.

8. A device as claimed in claim 1 further comprising:

an input-output optical waveguide for inputting said optical input signal; and

wherein said third optical output is transmitted to said input-output optical waveguide for output by said input-output optical waveguide.

9. A device as claimed in claim 1 further comprising focussing means for focusing said optical input signal.

10. A device for filtering at least a predetermined selected optical signal having a predetermined wavelength range from a series of optical signals, the device comprising:

first and second input/output optical waveguides;

a first birefringent crystal adjacent said first and second optical waveguides for spatial separation of orthogonal polarisations;

a first polarisation rotation element adjacent said birefringent crystal for rotating one of the orthogonal polarisations so as to produce an aligned polarisation output;

first variable polarisation manipulation means adjacent said first polarisation rotation element for manipulating said aligned polarisation output in a controlled manner so as to produce a rotated polarisation output; and

a tunable Fabry Perot etalon liquid crystal filter adjacent said first variable polarisation manipulation means for filtering a tunable wavelength from said rotated polarisation output and

reflecting other wavelengths back through said first variable polarisation manipulation means, said first polarisation rotation elements, said first birefringent crystal element to said second optical waveguide.

11. A device as claimed in claim 10 wherein said device further includes a focussing means for focussing the light emitted from said waveguides.

12 A device for filtering a series of predetermined selected optical signals having predetermined wavelength ranges from a series of optical signals, the device comprising:

a polarisation alignment means for substantially aligning substantially orthogonal polarisation states of an optical input signal so as to produce a polarisation aligned optical signal;

a first polarisation manipulation means for independently imparting a first controlled polarisation manipulation to said polarisation aligned optical signal so as to output a first polarisation manipulated optical signal having one of at least two distinguishable polarisation states including a first polarisation state and a second polarisation state;

a first optical separation means for spatially separating a first selected optical signal from said series of optical signals when the polarisation state of the polarisation manipulated optical manipulated signal is in a first polarisation state, thereby forming a first and second output optical signal, and maintaining the spatial alignment of said first selected optical signal with said series of optical signals when the polarisation manipulated optical signal is in a second polarisation state so as to form a third optical output;

a first reflection element, reflecting said first and third optical signal after they have passed through said first polarisation manipulation means; said reflection element reflecting the first and third optical signals towards a second polarisation manipulation means;

a second polarisation manipulation means for independently imparting a second controlled polarisation manipulation to said first and third optical signals so as to output a second polarisation manipulated optical signal having one of at least two distinguishable polarisation states including a third polarisation state and a fourth polarisation state;

a second optical separation means for spatially separating a second selected optical signal from said series of optical signals when the polarisation state of the second polarisation

manipulated optical signal is in a third polarisation state, thereby forming a forth and fifth output optical signal, and maintaining the spatial alignment of said second selected optical signal with said series of optical signals when the polarisation manipulated optical signal is in a fourth polarisation state so as to form a sixth optical output.

13. A device as claimed in claim 12 further comprising:

a first orthogonal polarisation spatial separation element placed adjacent the first polarisation manipulation means for spatially separating any residual orthogonal component of said first and third optical signals.

14. A device as claimed in claim 12 further comprising:

a second orthogonal polarisation spatial separation element placed adjacent the second polarisation manipulation means for spatially separating any residual orthogonal component of said first and third optical signals.

15. A device as claimed in claim 14 wherein the residual orthogonal component is monitored to provide operational information on said device.

16. A device as claimed in claim 12 wherein said first and second polarisation manipulation means include portions formed as part of the same substrate of a liquid crystal device utilising different electrode pairs.

17. A device as claimed in claim 12 wherein said first and second optical separation means include portions formed as part of the same substrate of a liquid crystal Fabry-Perot etalon device utilising different electrode pairs.

18. In a device for filtering at least a predetermined selected optical signal having a predetermined wavelength range from a series of optical signals, the device comprising:

a polarisation alignment means for substantially aligning substantially orthogonal polarisation states of an optical input signal so as to produce a polarisation aligned optical signal;

a polarisation manipulation means for imparting a controlled polarisation manipulation to said polarisation aligned optical signal so as to output a polarisation manipulated optical signal having one of at least two distinguishable polarisation states including a first polarisation state and a second polarisation state; and

an optical separation means for spatially separating the selected optical signal from said series of optical signals when the polarisation state of the polarisation manipulated optical signal is in a first polarisation state, thereby forming a first and second output optical signal, and maintaining the spatial alignment of said selected optical signal with said series of optical signals when the polarisation manipulated optical signal is in a second polarisation state so as to form a third optical output;

a method of operating the device as an add-drop multiplexer, the method comprising the steps of:

(a) inputting optical input light as said optical input signal;

(b) setting said polarisation manipulation means to said second polarisation state so as to maintain the spatial alignment of said selected optical signal with said series of optical signals;

(c) tuning said optical separation means to select said predetermined wavelength range of operation; and

(d) setting said polarisation manipulation means to said first polarisation state so as to spatially separate said first and second output optical signals.

19. A method as claimed in claim 18 wherein said optical separation means includes a liquid crystal Fabry – Perot etalon and said method further comprises driving the etalon for rapid switching, the method further comprising the steps of iteratively:

(a1) utilising an AC waveform of a first frequency and magnitude to drive the liquid crystal to a first polarisation rotation state;

(b2) increasing the frequency of the AC waveform to a second frequency to drive the liquid crystal to a second polarisation rotation state;

(c3) decreasing the magnitude of the AC waveform to a low level whilst maintaining said second polarisation rotation state.

20 19. A method of driving a liquid crystal Fabry – Perot etalon for rapid switching, the method comprising the steps of iteratively:

(a) utilising an AC waveform of a first frequency and magnitude to drive the liquid crystal to a first polarisation rotation state;

(b) increasing the frequency of the AC waveform to a second frequency to drive the liquid crystal to a second polarisation rotation state;

(c) decreasing the magnitude of the AC waveform to a low level whilst maintaining said second polarisation rotation state.

20. A device as claimed in claim 1 further comprising:

monitoring means for monitoring a residual signal transmitted through the optical separation means when said polarisation manipulated optical signal is in a second polarisation state.

21. A device as claimed in claim 1 wherein said optical separation means includes a liquid crystal Fabry – Perot etalon filter which further comprises:

a first and second partially reflective substrate;

a liquid crystal material interposed between the partially reflective substrates;

an electric field generation means generating an electric field over the liquid crystal material;

wherein the reflectivity of one of the substrates is altered to differ from the other and the electric field is manipulated so as to increase the transmission characteristics of the filter at a predetermined frequency.

22. A device as claimed in claim 1 wherein said optical separation means includes a liquid crystal Fabry – Perot etalon filter which further comprises:

a first and second substrate;

a liquid crystal material interposed between the reflective substrates;

at least one transparent electrode affixed to the surface of at least the first substrate; and

wherein said first substrate includes a transparent material having a thermal conductivity substantially greater than glass.

23. A device as claimed in claim 22 wherein the substrate is formed from sapphire or crystalline quartz.

24. A device as claimed in claim 1 wherein said device includes:

at least one liquid crystal device having a liquid material suspended between a first and second substrate, with at least one substrate containing an electrode, said material altering first physical properties in accordance with an applied electric field; and

high frequency alternating current application means for applying a high frequency alternating current to said at least one electrode, thereby heating the electrode and consequently heating the liquid material, said frequency being such that the first physical properties of said liquid material are substantially unaffected by said high frequency alternating current.

25. A device as claimed in claim 1 further comprising a lens array for focussing the light emitted from and transmitted to a series of input/output optical waveguides.

26. A method of heating a liquid material suspended between a first and second substrate, with at least one substrate containing an electrode, said material altering first physical properties in accordance with an applied electric field, the method comprising the step of:

applying a high frequency alternating current to said at least one electrode, thereby heating the electrode and consequently heating the liquid material, said frequency being such that the first physical properties of said liquid material are substantially unaffected by said high frequency alternating current.

27. A method as claimed in claim 26 wherein said liquid material comprises a liquid crystal material and said first physical properties include an effective refractive index of light traversing said material.

28. A method as claimed in claim 27 wherein said electrode is optically transparent and, in conjunction with a second electrode is used to form an electric field across said liquid material.

29. A method as claimed in claim 28 wherein said at least one electrode is formed from indium tin oxide (ITO) and said substrate further includes a series of conductive metal lines attached to said transparent electrodes

30. A telecommunication system including a device for filtering at least a predetermined selected optical signal having a predetermined wavelength range from a series of optical signals, the device comprising:

a polarisation alignment means for substantially aligning substantially orthogonal polarisation states of an optical input signal so as to produce a polarisation aligned optical signal;

a polarisation rotation means for imparting a controlled polarisation rotation to said polarisation aligned optical signal so as to output a polarisation rotated optical signal having one of at least two distinguishable polarisation states including a first polarisation state and a second polarisation state; and

an optical separation means for spatially separating the selected optical signal from said series of optical signals when the polarisation state of the polarisation rotated optical signal is in a first polarisation state, thereby forming a first and second output optical signal, and maintaining the spatial alignment of said selected optical signal with said series of optical signals when the polarisation rotated optical signal is in a second polarisation state so as to form a third optical output.